

CLAIMS

What is claimed is:

1. A method for defining a Region Of Interest (ROI) for subsequent processing, comprising:
specifying a physical characteristic of a morphological structure;
providing at least one image of a portion of the morphological structure, said image
containing the physical characteristic; and
5 automatically processing the image to identify the ROI in the image, wherein the ROI
contains the physical characteristic, and wherein the ROI is smaller than the original image.
2. The method of Claim 1 wherein specifying a physical characteristic of the morphological
structure comprises specifying an Intima Media Thickness (IMT) of an artery.
3. The method of Claim 2 wherein specifying the IMT comprises specifying the IMT of a
carotid artery.
4. The method of Claim 3 wherein specifying the IMT of the carotid artery comprises
specifying the IMT of the carotid artery between approximately 1.0 cm and approximately 1.5 cm
below the base of the bulb.
5. The method of Claim 3 wherein specifying the IMT of the carotid artery comprises
specifying the IMT of the carotid artery between approximately 1.75 cm to approximately 2.25
cm below the bifurcation.
6. The method of Claim 2 wherein determining the IMT of an artery comprises determining
the IMT of a far wall of a carotid artery.
7. The method of Claim 1 wherein providing at least one image comprises providing at least
one digital image.

8. The method of Claim 1 wherein automatically processing the image comprises automatically comparing vertical slices of the image to find a bifurcation.

9. The method of Claim 8 wherein automatically comparing the vertical slices comprises automatically comparing vertical slices approximately two pixels wide to find the bifurcation.

10. The method of Claim 9 wherein automatically comparing vertical slices comprises automatically identifying stripes in the vertical slices, and comparing the stripes in substantially adjacent vertical slices to find the bifurcation.

11. The method of Claim 10 wherein automatically identifying stripes comprises automatically identifying stripes by identifying a grouping of three bands consisting of:

- a first light band corresponding to a first vessel wall;
- a second dark band corresponding to a vessel lumen; and
- a third light band corresponding to a second vessel wall.

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12. The method of Claim 11 wherein automatically identifying stripes by identifying a grouping of three bands further comprises identifying bands with at least a fifty percent confidence.

13. The method of Claim 1 wherein automatically processing the image comprises automatically comparing vertical slices of the image to find a bulb of the carotid artery.

14. The method of Claim 13 wherein automatically comparing vertical slices of the image to find a bulb of the carotid artery comprises automatically comparing the lumen diameters of the slices.

15. The method of Claim 14 wherein automatically comparing the lumen diameters of the slices comprises automatically determining where the Common Carotid Artery (CCA) lumen diameter grows approximately ten percent from one slice to the next slice.

16. The method of Claim 1 wherein automatically processing the image comprises:
automatically defining a defined region approximately twenty percent higher and
approximately twenty percent wider than the ROI from a previous frame; and
automatically performing a pattern match within the defined region to determine a new
5 ROI which matches a previous ROI.

17. The method of Claim 1 further including, if the automatically processing the image to
identify the ROI in the image fails, providing a technician-generated ROI.

18. The method of Claim 1 wherein the automatically processing the image to identify the ROI
comprises automatically processing the image to identify the ROI, wherein the ROI is
approximately 0.5 cm wide and approximately 0.5 cm deep.

19. A method for determining a Region Of Interest (ROI) for subsequent Intima Media
Thickness (IMT) analysis, the method comprising:

providing at least one digital frame of a portion of a carotid artery, wherein the frame
includes at least one of a set consisting of a bulb of the carotid artery and a bifurcation of the
5 carotid artery;

automatically processing the frame to identify the ROI in the frame, the automatically
processing comprising at least one of the set consisting of:

determining the ROI by detecting a bifurcation of the carotid artery, the determining
comprising:

10 slicing the frame into vertical slices;
automatically comparing at least one of the vertical slices to at least one other of
the vertical slices to find the bifurcation of the carotid artery;

determining an ROI horizontal extent ranging from approximately 1.75 cm before
the bifurcation to approximately 2.25 cm before the bifurcation;

15 identifying a highest point of a far wall segment of the carotid artery within the
ROI horizontal extent; and

determining an ROI vertical extent ranging from approximately 0.3 cm above the
highest point to approximately 0.2 cm below the highest point;

20 determining the ROI by detecting a bulb of the carotid artery, the determining
comprising:
slicing the frame into the vertical slices;
automatically comparing at least one of the vertical slices to at least one other of
the vertical slices to find the bulb of the carotid artery;
determining the ROI horizontal extent to range from approximately 1.00 cm before
25 the bulb to approximately 1.50 cm before the bulb;
identifying the highest point of a far wall segment of the carotid artery within the
ROI horizontal extent; and
determining the ROI vertical extent to range from approximately 0.3 cm above the
highest point to approximately 0.2 cm below the highest point; and
30 determining the ROI by pattern-matching a portion of the frame to a previous ROI
having a previous horizontal extent and a previous vertical extent; the determining comprising:
determining an expanded ROI horizontal extent to be the previous horizontal extent
expanded horizontally by a factor of approximately 1.2;
determining an expanded ROI vertical extent to be the previous vertical extent
35 expanded vertically by a factor of approximately 1.2;
performing an automatic pattern match comparing the previous ROI to the region
defined by the expanded ROI horizontal extent and the expanded ROI vertical extent; and
determining the ROI based on the highest correlation of the automatic pattern
match.

20. A system for processing ultrasound images of the carotid artery, comprising:
an ultrasound sensor;
an ultrasound apparatus adapted to generate frames ;
a sensor cable connecting the ultrasound sensor to the ultrasound apparatus, wherein the
5 ultrasound apparatus is adapted to receive measurements from the ultrasound sensor, and wherein
the ultrasound apparatus is further adapted to process the measurements to generate ultrasound
data;
a computer; and

10 a path adapted to carry the ultrasound data from the ultrasound apparatus to the computer,
 wherein the path is selected from a group consisting of dedicated cables, phone lines, a Local Area
 Network (LAN), the Internet, and a wireless path,

 wherein the computer is adapted to pre-process the ultrasound data to generate Regions
 Of Interest (ROIs) within the data for subsequent processing, wherein the ROIs are subsets of the
 ultrasound data.